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IN TWO SECTIONS

Section I

IN THIS ISSUE

The Application of Standard Costs to An Operating Budget, by Herman C. Heiser..... 121

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EDITORIAL DEPARTMENT NOTE

Today the industrial accountant is so preoccupied with the application of costs to products, jobs and contracts, and so hard hit by the growing shortage of office help that there is some tendency to let slide the cost control practices which have been developed over past years. But cost control is just as important today as it ever was. Excess costs, in the final analysis, represent wastes of material and labor. Shortages of material and labor are the principal deterrents to all-out production for war, making cost control a most essential element in the whole war program. The article in this issue of the *Bulletin* is an important contribution to cost control literature as a case study report of the coordination of standard costs with variable budgets.

Herman C. Heiser, the author of this article, was born in New York City and attended school and college there. He is a New York, C.P.A., a member of the New York Society of C.P.A.'s, and a member of the Philadelphia Chapter, which he is now serving as Vice President. For some years, Mr. Heiser was connected with General Motors Corp. in the Dealer Accounting Division of Pontiac Motor Car Co. Later he joined the staff of Lybrand, Ross Bros. & Montgomery in New York, but in 1936 left public accounting to become Controller of the Crown Can Co., which at that time was being organized by the Crown Cork & Seal Co., Inc. He is also a Director of his company.

Articles published in the *Bulletin* present many different viewpoints. In publishing them the Association is not sponsoring the view expressed, but is endeavoring to provide for its members material which will be helpful and stimulating. Constructive comments are welcomed and will be published in the Forum Section of the *Bulletin*.

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OCTOBER 1, 1942

THE APPLICATION OF STANDARD COSTS TO AN OPERATING BUDGET

By Herman C. Heiser, Controller
Crown Can Company, Philadelphia, Pa.

IN view of present conditions calling for huge expenditures on production for war it becomes a patriotic duty of those in whose hands the management of American industry has been placed to utilize the taxpayer's dollar most effectively. This means economical operating costs. We as accountants have a definite and urgent responsibility in these times to assist management toward this end. However, I believe we do only a very small part of our job if we merely report the results of operations. Our job will not be completed until we have informed management what the operating results *should have been* and why the actual results differ therefrom.

In our company, we budget everything from sales—through production requirements, purchases, expenses, cash movements, expected profits and balance sheet position. However, I intend to limit the discussion to a variable budget measuring operating costs, and will omit any discussion of budgets of cash receipts and disbursements, balance sheet positions, fixed asset expenditures, and the many other parts of a complete budget which should also be maintained if a company is to be well managed. I plan to make this discussion a case study of the budget operated by our company and will try to treat it as broadly as possible so that it may have the widest possible application to your individual problems.

The Manufacture of Cans

In order that you may more readily understand our procedure, I shall give you a brief description of our industry.

The can industry's products are divided into two main classes:

(1) *Packers cans* which are the cans used for processing foods, and

(2) *General line cans* which include a variety of types such as motor oil cans, beer cans, insecticide cans, paint cans and various specialty cans such as aspirin boxes, shoe polish boxes, etc.

Volume is divided equally between the two classes.

Since the budget setup is determined by the manufacturing processes, I would like to describe briefly the steps in can production.

A packers can is made of tinplate which is steel coated with tin. The can is constructed in three parts, the top, the bottom and the body. The ends, that is the top and bottom, are punched out on large presses and the manufacture of these ends is a precision job requiring plate of the proper temper and extreme accuracy in fabrication so that when the end is applied to the body it will fit perfectly. An important feature of the ends is the concentric ridges which allow expansion and contraction during the food sterilization process and enable canners to detect improperly sterilized foods before shipment.

The body of the can is slit from sheets of tinplate and then formed in a machine called a "body maker" which hooks the side edges of the tinplate sheet together and swabs the seam with solder. One of the ends which have previously been rimmed with sealing compound is then crimped to the flanged body of the can. The other end of the can is sent to the canner and is crimped on at his plant after it has been filled with food and before it is placed in the retort for processing. When removed from the cooking retort the ends of the can are bulged from the internal pressure and when the contents have been cooled by immersing the can in a cold water bath the diaphragmatic action of the ends must be such that they will snap back into place when the internal pressure has been relieved. This is the purpose of the concentric ridges previously referred to.

Other Operations

Cans used for packing certain products require that the interior of the can be coated with a special enamel since contact with the tin might cause discoloration of the product. This is true of corn and for this reason all cans for packing corn must be coated with "C" enamel. This enamel is applied on the full sheet before the bodies or ends are fabricated. This operation also requires precision. Since a proper solder bond cannot be obtained over an enamel coating, a thin strip must be left uncoated so that solder may be applied on the side seam of the can. The width of the uncoated

surface must be gauged with accuracy. If too narrow, the soldering will not be complete; if too wide, so as to extend beyond the seam, uncoated surface will be exposed to the food contents.

General line cans differ from packers cans in that they are used for products which are not sterilized within the can. A great many types of general line cans are decorated by lithography, similar to that used in color work in magazines.

Thus, the steps in can manufacturing may be summarized as follows:

Packers cans:

1—Coating
2—Stamping, punching out and lining the ends
3—Slitting the bodies
4—Assembly
5—Packing

General line cans:

1—Printing
2—Coating with protective varnish and lacquer
3—Fabrication of the ends, or as in the case of paint cans, rings and plugs
4—Fabrication of fittings, such as handles, nozzles, screw caps, bails, ears, etc.
5—Packing

From this it follows that the production departments of a can factory are:

1—Litho Press
2—Litho Coater
3—Slitter
4—Punch Press and Lining
5—Assembly
6—Packing

The service departments of the company include those which are common to most industrial plants—engineering, machine shop, maintenance, boiler room, receiving and stores, etc.

The Operating Budget

Before we began the installation of our operating budget, we came to the conclusion that it should be an integral part of our

accounting system, and have so set up our accounting methods to enable us to draw off the operating budget statements from our books of account as easily as we can draw off a balance sheet and income account. I wish to make clear that our budgets and our cost standards are one and the same thing—and as we compare our actual operations with our standards we are comparing them also with our budget.

Since our discussion is limited to an operating budget, dealing with manufacturing costs, we need only discuss the operation of our work-in-process ledger which constitutes the detail record in support of our work-in-process inventory account in our general ledger. In order to assist us in this case study, I have prepared a sample of the various forms used by us in operating this account.

The Work-in-Process Ledger

Exhibit 1 represents the work-in-process ledger sheet and is the master sheet for the preparation of the operating budget. A separate sheet is prepared for each department with a control sheet for each plant and a control sheet for all plants. Each department's actual operating costs are compared with budgeted operating costs for tinplate, finished parts, direct material, direct labor and overhead. We have separated tinplates from other direct materials since it represents such a large portion of our operating costs and, therefore, is an item which bears close watching. Finished parts represent ends and fittings such as nozzles, handles, bales, etc. The operation of the work-in-process accounts is very simple. The account is debited with the work in process inventory at the beginning of the month and is debited with material and finished parts requisitioned from stores at standard, direct labor from the payroll distribution at actual and for the total actual overhead charges for the month. In support of the total overhead charge, we accumulate on tabulating equipment a breakdown of the items making up the total overhead for the department.

The work-in-process account is then credited with the work-in-process inventory at the end of the month, and a corresponding debit is made to the same sheet for the inventory at the beginning of the following month. This inventory is taken physically at the

EXHIBIT 1

FACTORY LEDGER - WORK IN PROCESS

PLANT LOCATION _____ PLANT NO. _____

DEPARTMENT _____ DEPT. NO. _____

Date	Reference	Acct. No.	DESCRIPTION	Quantity	Fl. or Dec. Tinplate	Finished Parts	Direct Material	Direct Labor	Overhead	Total
Jan. 1		Dr.	Inventory Beginning							
30		Dr.	Material Requisitions							
30		Dr.	Fin. Prs. Requisitions							
30		Dr.	Direct Labor							
30		Cr.	Inventory End							
			Actual Cost of Production							
30		Cr.	Production at Standard							
		Dr. or Cr.	Budget Variance							
Feb. 1		Dr.	Inventory Beginning							

end of each month and is priced at standard. The balance of the account at this point represents the actual cost of finished production for each department. The account is now credited with the standard cost value of the quantities produced by each department; the corresponding debit being to finished stores. The resulting balance in the work-in-process account now represents the budget variation and is taken directly off this ledger sheet to the departmental operating budget form which is submitted to each foreman, supervisor or division head.

Cost Standards

Before describing the departmental budget report, I should like to discuss the determination of the standard costs which serve as the basis of the foregoing entries. It will be readily understood that the success of an operating budget cannot be assured unless the standards used are kept current. We were confronted with preparing standards for close to 10,000 different cans or items. In order to assure that our standards could be kept current, we had first to reduce the standards to a workable number. This was accomplished by a careful study and classification of the various cans manufactured by us into standard cost groups.

The method of computing standards should also be carefully studied so that changes can be readily made when required. We accomplish this by establishing standards as follows:

1. Master standards for material, labor and overhead.
2. Standards for each can or part.

The master standards were set up on rate sheets for each type of material used as illustrated on Exhibit 2. The master standards for direct labor were set up on rate sheets as illustrated on Exhibit 3. Overhead rates were also set up on master rate sheets and will be described later.

From the master rate sheets, we prepare our individual standard costs for each can or part. Our standard costs fall into three groups:

Decorated Stock
Finished parts
Finished cans

EXHIBIT 2

OTHER DIRECT MATERIAL STANDARDS

SOLDER - ASSEMBLY DEPT.

Type Can	Type Solder Used	Lbs. Solder Used (Net) Per M Inches	Lbs. Wipings Received Per M Inches	Length of Side Seam in Inches	Net Lbs. Solder Used Per M Cans	Lbs. Wipings Recovered Per M Cans	Solder Price Per Lb.	Cost to Reclaim Wipings Per Lb.	Net Solder Cost Per M Cans	Wipings Recovery Cost Per M Cans	Total Cost Per M Cans

EXHIBIT 3

DIRECT LABOR STANDARDS
ASSEMBLY DEPT.

Can Size Sanitary	Production Rate (Hours Per M)	Operators Male	Operators Female	Labor Cost Per Hr.	Cost Per M Cans

Standard Cost Sheets

Exhibits 4 and 5 represent individual standard cost sheets. You will note that the forms provide for computing standard costs for each of the cost elements shown on the work-in-process ledger. The standard cost sheets are prepared from the master rate sheets as indicated on the form.

You will note that all of the cost sheets call for a common unit, namely, "base boxes." This unit may require some explanation. The steel mills in marketing tinplate found it necessary to arrive at a unit which would take into consideration not only the weight of steel but also the surface area, since the area of the sheet determines the amount of tin required to cover it. The steel mills, therefore, adopted a uniform unit which consists of 112 sheets 14" x 20" weighing 100 pounds. By this means if a customer required a lighter gauge sheet, differentials were provided allowing only for the lesser amount of steel required, since the lighter gauge sheet would require the same amount of tin coverage. Thus, we have 95#, 90# and 85# plate indicating the number of pounds that 112 sheets 14" x 20" would weigh. A number two can, for example, is made out of 95# plate, or a gauge of .0107 inches (31 gauge U.S.S.). The base box unit was adopted by can manufacturers and incorporated in their sales contracts

EXHIBIT 4

Date..... Part No.....

STANDARD COST—DECORATED STOCK

Description .....

Plate Base.....F.O.B. Pittsburgh (Excl. Frt. to Mfg. Plant.....

Total B.B. per M Sheets.....

					Standard Cost Per M Sheets
PLATE					
Sheet Size					
Wt. & Desc..... No. Out.....				.....	
Spoilage Allowance.....%				.....	
OTHER DIRECT MATERIAL					
	No. of Coats	Base Boxes Per M Sheets			
Coating	.....	..... @	per B.B.	.....	
Varnish	.....	..... @	" "	.....	
Process Lacq.	.....	..... @	" "	.....	
Size	.....	..... @	" "	.....	
Sanitary Enamel	.....	..... @	" "	.....	
Inks	.....	@	" M	.....	
DIRECT LABOR					
Squaring		..... @	per M	.....	
Coating No. of Impressions		..... @	" "	.....	
Printing " " "		..... @	" "	.....	
DEPARTMENTAL OVERHEAD					
Rate: Depts. 15 & 16—.....% of Direct Labor					
				Total	

which provide for adjustments in can prices as the market prices of tin plate fluctuates. Thus, for each can that is sold a tinplate differential is computed representing the number of base boxes of plate required to make the particular type of can.

The standard costs computed in accordance with Exhibits 4 and 5 are used to convert the production of each department into budgeted costs. The quantities produced in each department are multiplied by each of the cost elements shown on the standard sheets. The results are summarized for each department and are the basis for the credit to the work-in-process ledger for production at standard. These same standard cost sheets are used for

EXHIBIT 5

Date..... Part No.....

STANDARD COST—FINISHED CANS OR PARTS

Description .....

Plate Base.....F.O.B. Pittsburgh (Excl. Frt. to Mfg. Plant)

Base Boxes per M Bodies.....Top.....Bottom..... .....Total B.B.....

		Standard Cost Per M Cans
PLATE		
Sheet Size		
Wt. & Desc..... No. Out.....	.....	
Spoilage Allowance.....%	.....	═══
DECORATED STOCK		
Decoration No. ..... $.....		
Sheet Size		
Wt. & Desc. ..... No. Out.....	.....	
Spoilage Allowance.....%	.....	═══
FINISHED PARTS		
Bottom Part No.	.....	
Top " "	.....	
" "	.....	
" "	.....	
" "	.....	═══
OTHER DIRECT MATERIAL		
Solder	.....	
Misc.	.....	
.....	.....	
.....	.....	
.....	.....	═══
DIRECT LABOR		
Slitter: $ Per M Sheets	.....	
Dept.	.....	═══
DEPARTMENTAL OVERHEARD		
Dept. ..... : .....% of Direct Labor		═══
HANDLING & GENERAL FACTORY		
Direct Labor: $.....		
Deco. Direct Labor ..... $.....%	.....	
..... B.B. @ ..... per B.B.	.....	═══
	Total	═══

costing of all movements "in" and "out" of finished stores including cost of sales. You will note that the standard cost sheet for finished cans shows a space for inserting the cost of the decorated sheet and the finished parts which are requisitioned from stores for a complete can.

Direct Materials

Direct materials used in can manufacturing are:

1—Tinplate
2—Solder
3—Lining Compound
4—Cartons and Packing Materials
5—Fittings

Standards are established for all direct materials based upon the contract price or current market price. Difference in prices from standard are handled through variance accounts, although when significant changes in prices arise, the standards are corrected.

An interesting point in connection with the cost of direct materials is the method we use to handle freight on tinplate. Since one of the important cost factors in the can business is the cost of transportation of raw materials and finished products, we have segregated the freight on tinplate into separate accounts rather than include the freight in the raw material cost. Into this freight account, we charge not only the freight from the steel mill to our branch plant but also the freight on the shipment of ends from the plant manufacturing ends to the plants using the ends. These freight accounts, together with the accounts used for accumulating the freight costs on finished products, are important keys in determining the proper location of manufacturing plants. Another interesting point is that we include in our direct material standards normal allowance for spoilage.

Direct Labor

Direct labor standards are established by our time study division and are used for wage payment as well as for cost standards. These standards are set in units of hours per thousand. Thus we

say that a direct labor standard is .08 hours per thousand cans. This is obtained by dividing the number of hours by the production rate. The production rate is in most cases established by the machine speeds after deducting normal allowances for machine stoppage.

Overhead

Our overhead accounts include supervisors' salaries, indirect labor, overtime premium, maintenance of machinery and equipment, fuel oil, light and power, depreciation, floor space, workmen's compensation insurance, Federal old age benefits, and unemployment taxes.

In establishing standard overhead rates, we first consider the capacity of each of the departments in each of our plants. This capacity is translated into terms of units of production and then into dollars of direct labor. Our top management next decides the normal activity to be expected of each department after giving full consideration to seasonal peaks, customers' requirements for delivery and the limitations of our equipment. Normal activity represents a percentage of 52 forty-hour weeks of production. Using the capacity of equipment weighted by the normal activity percentage, the cost department computes the annual budgeted direct labor, the annual budgeted overhead and the corresponding overhead rate. It may be of interest to state that we have adopted uniform overhead rates for like departments in each of our plants so that the budgeted variances in overhead can be used to compare the relative effect of production volume in each plant.

You will note by referring to Exhibit 5 that handling and general factory overhead is treated separately from departmental overhead. We have found it simpler and more effective to treat general factory and handling expenses as a separate department, absorbing these costs directly into the costs of the individual item when it is produced, rather than to distribute such handling and general factory expenses to each department. As a separate item under general factory expense, we include Federal old age benefits, workmen's compensation and unemployment insurance and absorb this directly into the cost of the can as a percentage of the direct labor dollar. This method simplifies the bookkeeping since it

eliminates the necessity of distributing these items departmentally each month. The unit of distribution used for distributing all other handling and general factory expenses is "base boxes" which unit I described earlier. This unit was chosen because the weight, bulk, and value of the cans vary somewhat proportionately to the number of base boxes required to fabricate them.

Overhead Standards

In addition to the overhead rates I have just described, we also established overhead standards for each item of departmental overhead expense and established such standards at varying degrees of activity. These standards are used in budgeting the overhead expenses of each department. For example, let us take supervisors' salaries shown in Exhibit 6. For any activity up to 100 per cent, we will allow supervisors' salaries for one shift; for any activity from 100 to 200 per cent, we will allow supervision salaries for two shifts, etc. On indirect labor, we allow a graduated rate per thousand units produced depending upon the activity of the department—such rates recognizing the semi-variable nature of this item of expense. No budget is allowed for overtime premium. Depreciation and floor space standards are fixed for each department and do not vary for different activities.

Departmental Budget Reports

Let us consider now the final departmental budget report which is shown as Exhibit 6. You will note in the upper right hand corner space is provided for two percentages. These we consider to be the key to the detailed information set forth below. The first percentage of activity, as we explained before, represents the number of hours actually run compared to a full eight-hour shift for the entire month. The percentage of operating efficiency represents the relationship of the actual cans produced to the number of hours run. By "hours run", we generally mean the hours during which direct labor is kept on the machines. The direct costs shown on the budget are taken directly from the factory work-in-process ledger, both for budgeted costs and actual costs. Gains or losses are computed as well as unit cost and percentage of budget efficiency. The total actual overhead and the total overhead absorbed are also taken from the work-in-process ledger and

EXHIBIT 6

	MONTH	YEAR TO DATE
% ACTIVITY		
%OPER. EFF.		

DEPARTMENTAL BUDGET

PLANT_____ DEPT._____ MONTH _____ DEPT. UNIT_____

ACCT.	DESCRIPTION	UNIT OF MEASURE	UNIT RATE	UNITS PRODUCED		THIS MONTH			YEAR TO DATE			UNIT COST		% BUDGET	
				THIS MONTH	YEAR TO DATE	BUDGET COST	ACTUAL COST	GAIN OR LOSS	BUDGET COST	ACTUAL COST	GAIN OR LOSS	THIS MONTH	YEAR TO DATE	THIS MON.	YEAR TO DATE
	Plain or Dec. Plate														
	Finished Parts														
	Other Direct Material														
	Direct Labor														
	Total Direct Costs														
	OVERHEAD														
	Supervisors' Salaries	Semi-Fixed													
	Indirect Labor	M Cons													
	Set-Up Labor	"													
	Overtime Premium	"													
	Maint. Mach. & Equip. Labor	"													
	Maint. Mach. & Equip. Mat'l & Exp.	"													
	Litho & Fuel Oil	"													
	Light & Power	"													
	Gas	"													
	Misc. Sup. & Exp.	"													
	Depreciation	Fixed													
	Floor Space	Sq. Ft.													
	Budget Performance														
	Over or Under Absorbed Overhead														
	Total Overhead														
	Total Prod. Costs														

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the gain or loss computed. In the "actual cost column" we enter by expense classification the amounts comprising the total actual overhead shown in the work-in-process ledger and then compute from our standard rate sheets, the budgeted overhead expenses, taking into consideration, of course, the activity shown for the department that month and the number of units produced. A comparison of these items will then show the budgeted performance of the department head; and the difference between "budgeted performance, gain or loss," and the "total overhead, gain or loss," will represent the amount of overhead under- or over-absorbed due to variances in production volume. You will see, therefore, that we have now allocated our overhead variances to two factors, each of which is under the control, generally speaking, of separate divisions: (1) the variance in the amounts expended shows the budgeted performance of the production department head while (2) the effect in the variances of production volume can be charged in some cases to the sales division, or in other cases to top management. The breakdown of overhead variances into these two figures has enabled us to make considerable savings by charging the proper activity or department head with his inefficiencies or shortcomings.

Summary

In conclusion, I would like to summarize as follows:

1. An operating budget can furnish management with the means of obtaining economical operating results.

2. Standard costs prepared with this view in mind are effective tools for constructing and maintaining an effective operating budget.

3. The operating budget should be an integral part of the accounting system so that budget reports may be easily and quickly obtained at the close of each accounting period.

4. The method of computing and maintaining cost standards should be organized so as to enable the company to maintain up-to-date measures of operating efficiency.

5. Overhead rates should be established at normal activities so that variances from standard will measure the effect upon operating profits of abnormal or sub-normal production volume.

6. Uniform rates of overhead should be established for all plants so that variances from standard can be used as comparisons of operating efficiencies between plants.

Finally, standards should be established so as to create variances which can be used for management to determine the causes for operating inefficiencies and such variances should be isolated so that they are not made useless by the inclusion of several contributing factors.

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